UNITED STATES PATENT AND TRADEMARK OFFICE

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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Ex parte IZIK EIDUS, LEONID SHATZ, MICHAEL RAPOPORT, and
ALEXANDER FISHMAN

_____

Appeal 2016-007946
Application 13/426,861[1]
Technology Center 2100

_____

Before SCOTT B. HOWARD, JOHN D. HAMANN, and ALEX S. YAP,
Administrative Patent Judges.

HOWARD, *Administrative Patent Judge.*

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's
Final Rejection of claims 1–4, 6–11, 13, 14, 16, and 17, which constitute all
of the claims pending in this application. Claims 5, 12, 15, and 18–23 have
been cancelled. App. Br. 19–21. We have jurisdiction under 35 U.S.C.
§ 6(b).

We affirm.

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[1] Appellants identify Ravello Systems LTD. as the real party in interest.
App. Br. 3.

THE INVENTION

The disclosed and claimed invention is directed to a system and method thereof for running an unmodified guest operating system in a para-virtualized environment. Abstract.

Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. An apparatus operating in a para-virtualized environment, comprising:
> a processor; and
> a memory coupled to the processor and configured to store at least a first set of instructions for a first hypervisor for execution by the processor and a second set of instructions for a second hypervisor for execution by the processor over the first hypervisor, wherein the first hypervisor is configured to enable execution of an unmodified guest program over the second hypervisor, the second hypervisor configured to capture at least a privileged instruction called by the unmodified guest program and translate the at least privileged instruction to at least a corresponding instruction of the first set of instructions executable by the first hypervisor, wherein the unmodified guest program and the second hypervisor operate in a user space protection domain, and wherein the first hypervisor is a para-virtualized hypervisor.

REFERENCES

The prior art relied upon by the Examiner as evidence in rejecting the claims on appeal is:

Weissman et al. ("Weissman")	US 2010/0257524 A1	Oct. 7, 2010
Dang et al. ("Dang")	US 2011/0047542 A1	Feb. 24, 2011
Yehuda et al. ("Yehuda")	US 2011/0047544 A1	Feb. 24, 2011
Day, II et al. ("Day")	US 2011/0072428 A1	Mar. 24, 2011

REJECTIONS

Claims 1–4, 6, 7, 9–11, 14, 16, and 17 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Day in view of Dang and Weissman. Final Act. 3–14.

Claims 8 and 13 stand rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Day in view of Dang, Weissman, and Yehuda. Final Act. 14–16.

ANALYSIS

We have reviewed the Examiner's rejection in light of Appellants' arguments that the Examiner erred. In reaching this decision, we have considered all evidence presented and all arguments made by Appellants.[2] We disagree with Appellants' arguments with respect to claims 1–4, 6–11, 13, 14, 16, and 17, and we incorporate herein and adopt as our own: (1) the findings and reasons set forth by the Examiner in the action from which this appeal is taken (Final Act. 3–14) and (2) the reasons and rebuttals set forth in the Examiner's Answer in response to Appellants' arguments (Ans. 3–6). We incorporate such findings, reasons, and rebuttals herein by reference unless otherwise noted. However, we highlight and address specific findings and arguments for emphasis as follows.

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[2] Rather than reiterate the entirety of the arguments of Appellants and the positions of the Examiner, we refer to the Appeal Brief (filed Feb. 16, 2016); the Reply Brief (filed Aug. 19, 2016); the Final Office Action (mailed May 20, 2015); and the Examiner's Answer (mailed June 20, 2016) for the respective details.

First, Appellants argue the Examiner erred in finding Day teaches a hypervisor "configured to capture at least a privileged instruction called by the unmodified guest program," as recited in claim 1. App. Br. 6–7. More specifically, Appellants argue "Day appears to relate only to particular privileged instructions, such as VMREAD and VMWRITE instructions, and **not** to privilege instructions in general." App. Br. 7.

During prosecution, claims must be given their broadest reasonable interpretation while reading claim language in light of the specification as it would be interpreted by one of ordinary skill in the art. *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004). Under this standard, we interpret claim terms using "the broadest reasonable meaning of the words in their ordinary usage as they would be understood by one of ordinary skill in the art, taking into account whatever enlightenment by way of definitions or otherwise that may be afforded by the written description contained in the applicant's specification." *In re Morris*, 127 F.3d 1048, 1054 (Fed. Cir. 1997).

Claim 1 recites that "the second hypervisor configured to capture *at least a privileged instruction* called by the unmodified guest program and translate *the at least privileged instruction* . . . ." App. Br. 18 (emphasis added). The Examiner concludes, and we agree, that the broadest reasonable construction of the claim does not require all privileged instructions to be captured. *See* Ans. 3. Instead, the claim only requires one privilege instruction to be captured. Because Appellants' arguments are not commensurate with the scope of the claims, they are unpersuasive. *See In re Self*, 671 F.2d 1344, 1348 (CCPA 1982).

Second, Appellants argue the Examiner erred in finding Day teaches "the **second hypervisor configured to capture** at least a privileged **instruction called by the unmodified guest program**," as recited in claim 1. App. Br. 18 (emphasis added). App. Br. 7–8; Reply 2–4. According to Appellants, Day teaches privileged commands issues by the hypervisor, not the guest program. App. Br. 8 ("In direct contrast, Day teaches that it is the secondary VMM, not the unmodified guest, that issues the privileged instruction, and such an instruction is captured in Day by the primary VMM 30 and not the second hypervisor, as required by claim 1." (emphasis omitted)); Reply Br. 2 ("Specifically, the Examiner relies on the privileged instructions 'VMREAD and VMWRITE issued by the secondary VMM.'" (emphasis omitted) (quoting Day ¶ 26)).[3]

The Examiner finds "Day figure 1 shows a nested VMM structure wherein a guest program runs on a VM (secondary VM 36) which is encapsulated on top of the a [sic] VMM (secondary VMM 34)." Ans. 4; *see also* Final Act. 4–6. The Examiner further finds:

> one of ordinary skill in the art can readily recognize that a core function of a VMM is to receive a privileged instruction issued by its guest, process those privileged instructions (either through trap and emulate, or through binary translation) and pass it down to the layer below, and thus similar functionality would be present on the secondary VMM to process privileged instructions issued by its guest (secondary VM 36).

Ans. 4.

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[3] In Day, VM refers to a virtual machine and VMM refers to virtual machine monitor. *See* Day ¶ 19. Because the Examiner and Appellants use the same nomenclature in describing the prior art, so do we.

Day teaches a guest program 38 operating over a secondary VMM 34 and a primary VMM 30. Day Fig. 1. Although Day further teaches the secondary VMM issues privileged commands VMREAD and VMWRITE, we agree with the Examiner that a person of ordinary skill would understand that guest program 38 provides those instructions. *See In re Preda*, 401 F.2d 825, 826 (CCPA 1968) (holding "it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom"); *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994) (holding that prior art references must be "considered together with the knowledge of one of ordinary skill in the pertinent art"). Accordingly, we are not persuaded by Appellants' argument that the Examiner erred.

Third, Appellants argue the Examiner admitted Day does not teach a second hypervisor "configured to . . . translate the at least privileged instruction to at least a corresponding instruction of the first set of instructions executable by the first hypervisor." *See* App. Br. 8–12. According to Appellants, translation of privileged commands is not a core function of a VMM and that it has a number of disadvantages, including the use of substantial overhead. *Id.* For the same reason, Appellants argue the Examiner did not properly take Official Notice based on Weissman. *Id.*

The Examiner finds Weissman teaches that "[b]inary translation is a core feature of VMM, which is used to trap privileged instructions issued by its guest and translate it to a version that can be executed by its host." Final Act. 5 (citing Weissman ¶¶ 52–56); *see also* Ans. 4 ("Weissman reference was further introduced to support the examiner's assertion that binary translation and trap and emulate are core functions of the VMM."). Based

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on the teaching of Weissman, the Examiner takes Official Notice that "it would be obvious for one of ordinary skill in the art to know the same technic [sic] can be applied to a nested virtualization setup as taught by Day." Final Act. 5.

Weissman teaches that binary translation can be used to translate a guest instruction "into one or more instructions." Weissman ¶¶ 52–53. Weissman further teaches that the translations can be stored for "immediate recall" and to "mitigate [against] the decreased performance that binary translation typically causes." Weissman ¶ 53. Although both the Examiner and Appellants focus on whether or not binary translation is a core function of a VMM, binary translation is a function of the VMM taught by the prior art of record. Because the prior art teaches a VMM with that feature, we need not decide whether or not it is a core function.

Furthermore, Appellants have not identified a claim limitation associated with the amount of overhead used by the VMM. Because Appellants' arguments directed to the substantial overhead used by binary translation is not commensurate with the scope of the claims (*see* Ans. 5), we are not persuaded that the Examiner erred. *See Self*, 671 F.2d at 1348.

Fourth, Appellants argue that neither Weissman nor Dang teach or suggest the specific pair of hypervisors recited in claim 1. App. Br. 12 ("Furthermore, Weissman does not deal with the case of an ordinary VMM and paravirtual VMM. Therefor[e,] even if, for the sake of argument, the Examiner's logic was correct, which Appellants are not admitting, it would not apply with regard to the instant claims." (emphasis omitted)); App. Br. 13 ("As an initial point, Dang does not appear to have more than one hypervisor, so Dang cannot teach a second hypervisor, as required by

Appellants' claim 1." (emphasis omitted)). Appellants also argue Dang does not teach or suggest an unmodified guest program. App. Br. 13.

Nonobviousness cannot be established by attacking the references individually when the rejection is predicated upon a combination of prior art disclosures. *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). The test for obviousness is not whether the claimed invention is expressly suggested in any one or all of the references, but whether the claimed subject matter would have been obvious to those of ordinary skill in the art in light of the *combined teachings* of those references. *In re Keller*, 642 F.2d 413, 425 (CCPA 1981). Because Appellants' arguments are directed to the references individually—that is the arguments are not directed to the limitations that the Examiner cited the prior art for—we are not persuaded by the arguments that the Examiner erred.

Finally, Appellants argue "one of ordinary skill in the art would **not** be motivated to make the combination." App. Br. 13. More specifically, Appellants argue the prior art "taken as a whole, would have led one skilled in the art away from the combination relied upon by an Examiner." App. Br. 14. According to Appellant:

> Day is directed to solving a problem with particular privilege instructions when hypervisors are nested. Dang is directed to security issues with hypervisors, and in particular with para-virtual hypervisors. Weissman is directed to wasted resources when many virtual machines on a hardware platform are idle.
>   As can be seen, **none** of the references are directed to the problem recognized by Appellants' that the advantages of para-virtualization are counterbalanced by the disadvantages thereof. **Nor** are any of the references directed to employing the advantages of para-virtualization while still not requiring a modification of the guest. There is also **no** suggestion to

combine the piece parts selected by the Examiner in the manner claimed by Appellants.

App. Br. 14–15.

Rejections based on obviousness must be supported by "some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006), *cited with approval in KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 418 (2007). The Examiner finds a reason to combine the various elements of the prior art. *See* Final Act. 5–6 (reason for modifying Day in light of Weissman), 6–7 (reason for modifying Day in light of Dang); *see also* Ans. 6 (reason for modifying Day in light of Dang). We agree with and adopt the Examiner's findings, which provide an articulated reasoning with rational underpinnings to support the legal conclusion of obviousness.

We further determine that Appellants' arguments directed to the reasoning are legally insufficient. First, we find Appellants have not established that the prior art teaches away from the claimed invention. Specifically, Appellants have not demonstrated that "a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed Cir. 1994).

Appellants merely describe the preferred embodiments of the prior art. However, a preferred embodiment, by itself, "does not teach away. . . [as] it merely expresses a general preference for an alternative invention but does not 'criticize, discredit, or otherwise discourage' investigation into the invention claimed." *DePuy Spine, Inc. v. Medtronic Sofamor Danek, Inc.*,

567 F.3d 1314, 1327 (Fed. Cir. 2009) (quoting *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)). In other words, such a stated preference is insufficient to teach away from the claimed invention. *See id.*; *Fulton*, 391 F.3d at 1201.

Second, our reviewing court guides it is irrelevant that the prior art and the present invention may have different purposes. *See Nat'l Steel Car, Ltd. v. Canadian Pac. Ry., Ltd.*, 357 F.3d 1319, 1339 (Fed. Cir. 2004) ("A finding that two inventions were designed to resolve different problems . . . is insufficient to demonstrate that one invention teaches away from another."). That is, it is sufficient that references suggest doing what an appellant did, although the appellant's particular purpose was different from that of the references. *In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983) (citing *In re Gershon*, 372 F.2d 535, 538–39 (CCPA 1967)). "Obviousness is not to be determined on the basis of purpose alone." *In re Graf*, 343 F.2d 774, 777 (CCPA 1965).

Accordingly, we are not persuaded by Appellants' arguments that the Examiner erred in combining the teachings of the prior art references.

For the reasons given above, we sustain the Examiner's rejection of claim 1, along with the rejection of claim 10, which is argued on the same grounds (App. Br. 15), along with the rejection of dependent claim s 2–4, 6, 7, 9, 11, 14, 16, and 17 (*id*).

With respect to dependent claims 8 and 13, Appellants contend that because the additional reference used in the rejection of those claims (Yehuda) do not cure the shortcomings of the other references applied against claims 1 and 10, the Examiner failed to make a prima facie case of obviousness for these claims. App. Br. 16. Because we determine that the

rejections of claims 1 and 10 are not erroneous for the reasons discussed above, we sustain the rejections of these claims.

DECISION

For the above reasons, we affirm the Examiner's decisions rejecting claims 1–4, 6–11, 13, 14, 16, and 17.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv). *See* 37 C.F.R. § 41.50(f).

AFFIRMED